

## South Puget Sound Geographic Response Plan Workshop

### Sensitive Species Information

The following maps (draft) represent the current knowledge of some of Washington Department of Fisheries' (WDF) trust resources. The maps focus on nearshore resources of high commercial, recreational, or ecological value. **Adult and juvenile life stages of a number of ecologically and economically important species including salmon, marine fish, baitfish, and shellfish as well as the plankton community are considered to be ubiquitous in distribution and therefore, are not displayed on maps.** Pertinent information on many of these species can be found in the habitat association and timing tables which include information on temporal and spatial distribution, preferred habitat, and relative abundance of various life history stages. This information must be considered in resource protection and damage assessments efforts.

Additional areas of resource occurrence are continually being documented. The extent of intertidal spawning habitat represented in the baitfish maps for surf smelt and Pacific sand lance is updated annually as new spawning areas are documented.

The shellfish maps do not offer complete information on intertidal and subtidal shellfish resources. Surveys run by WDF have been oriented to locating beds that could be commercially harvested. Many intertidal areas are privately owned tidelands upon which WDF has not undertaken a comprehensive inventory of the naturally produced or cultured shellfish resources. No attempt has been made on these maps to differentiate between areas which have not been surveyed and those in which shellfish were not found in commercial quantities.

Due to a combination of new data and incomplete data it is not safe to assume that blank areas on the maps are not of concern. If you have any questions regarding this information please contact the WDF Spill Response and Damage Prevention Unit at 206-902-2570.

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Pacific Herring (*Clupea harengus pallasii*)

**Resource Information Mapped:** Adult prespawning holding areas and spawning areas.

**Resource Use:** Human; sport bait fishery targets juvenile fish. Non-human; one of the most important components of the marine food chain; they provide the link between primary production and upper level predators. All life history stages utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

**General Location or Habitat Association:** Adult prespawning holding areas are located in the Tacoma Narrows, Carr Inlet, Hale Pass, Drayton Pass, Nisqually Reach, Case Inlet, and the entrance to Budd Inlet. In this region herring spawning occurs in Mayo Cove, Squaxin Passage, Hammersley Inlet, Totten Inlet, and Skookum Inlet. Herring deposit their eggs on marine vegetation, such as eel grass or algae, within the shallow subtidal and intertidal zones.

**Seasonal Sensitivity or Occurrence:** Adult herring congregate in relatively distinct areas during December through June prior to spawning. Exposure of pre-spawning adults to oil can result in the accumulation of hydrocarbon compounds in the yolk of maturing eggs. Metabolism of these compounds during embryonic and larval stages can result in lethal and sublethal genetic, cellular and morphological injuries. Spawning occurs from January through March. Eggs hatch after approximately 10 days. Larvae and subsequent juvenile fish are found in nearshore areas throughout the following summer. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

**Recommended Protection Strategy:** Utilize open water and nearshore containment and collection techniques to keep oil off of the spawning substrate throughout the region. Use exclusion boom where feasible (Mayo Cove, Skookum Inlet).

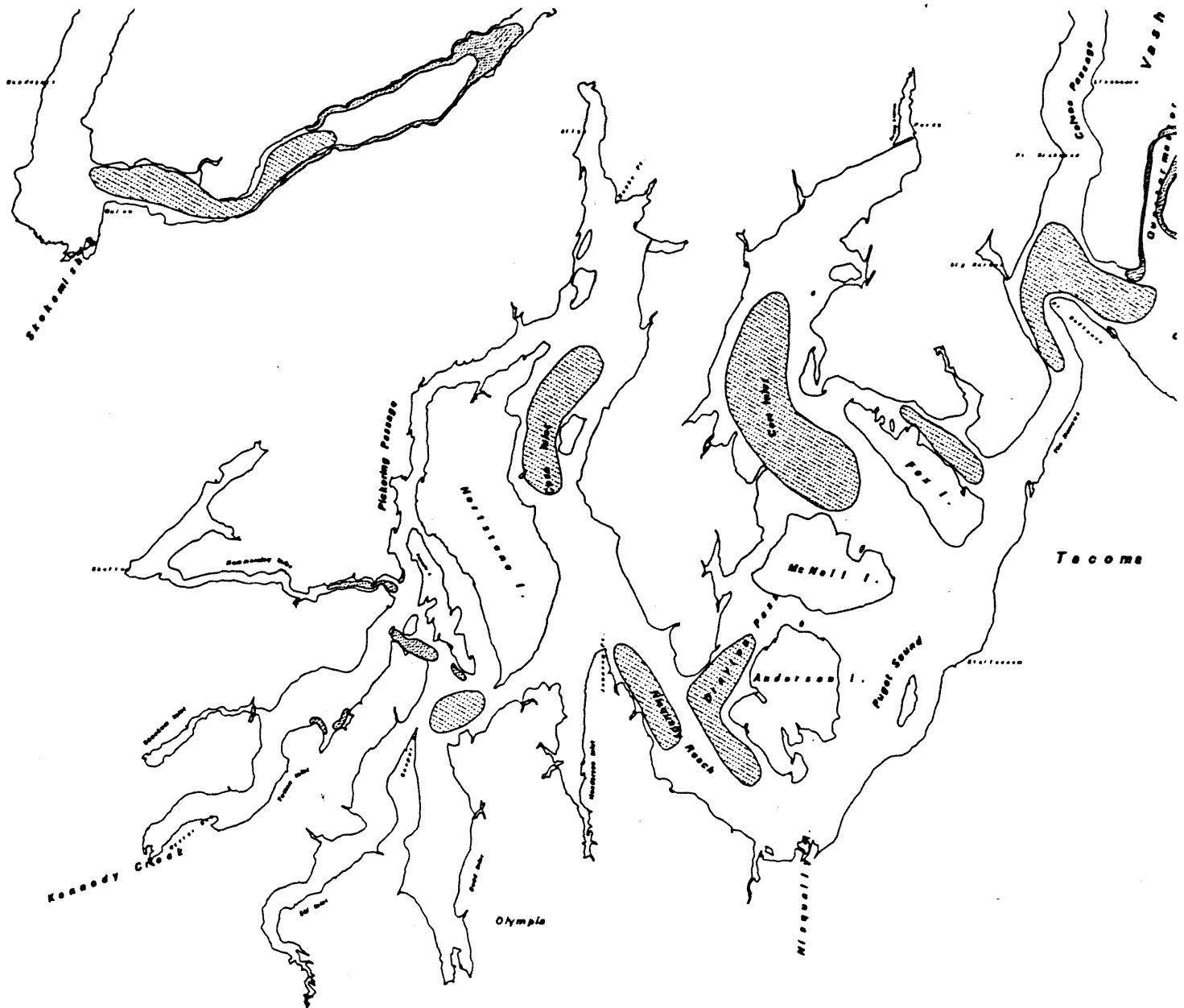
**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

# South Puget Sound Fish Resources



Herring Spawning



Herring Holding



USGS Shoreline



Meters



Source: Washington Department of Fisheries  
This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Surf Smelt (*Hypomesus pretiosus*)

**Resource Information Mapped:** Intertidal surf smelt spawning areas.

**Resource Use:** Human - commercial and recreational harvest. Non-human - important component of the marine food chain; smelt provide the link between primary production and upper level predators. All life history stages are utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

**General Location of Sensitive Resource:** Surf smelt deposit their eggs in the uppermost intertidal zone on gravel generally having a grain size from 1 to 7 mm. Incubation takes 2 - 4 weeks. Larvae are found in adjacent nearshore surface waters for several weeks following hatching. Spawning areas exist throughout the region with extensive contiguous stretches in Henderson, Budd, Eld, and Totten Inlets. Other undocumented spawning areas are suspected in the region.

**Seasonal Sensitivity or Occurrence:** Surf smelt spawning occurs in this region from July through March. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

**Recommended Protection Strategy:** Keep oil off of spawning beaches regardless of season. Utilize aggressive open water and nearshore containment and collection techniques to keep oil off of the spawning substrate. Use protection or exclusion boom where feasible.

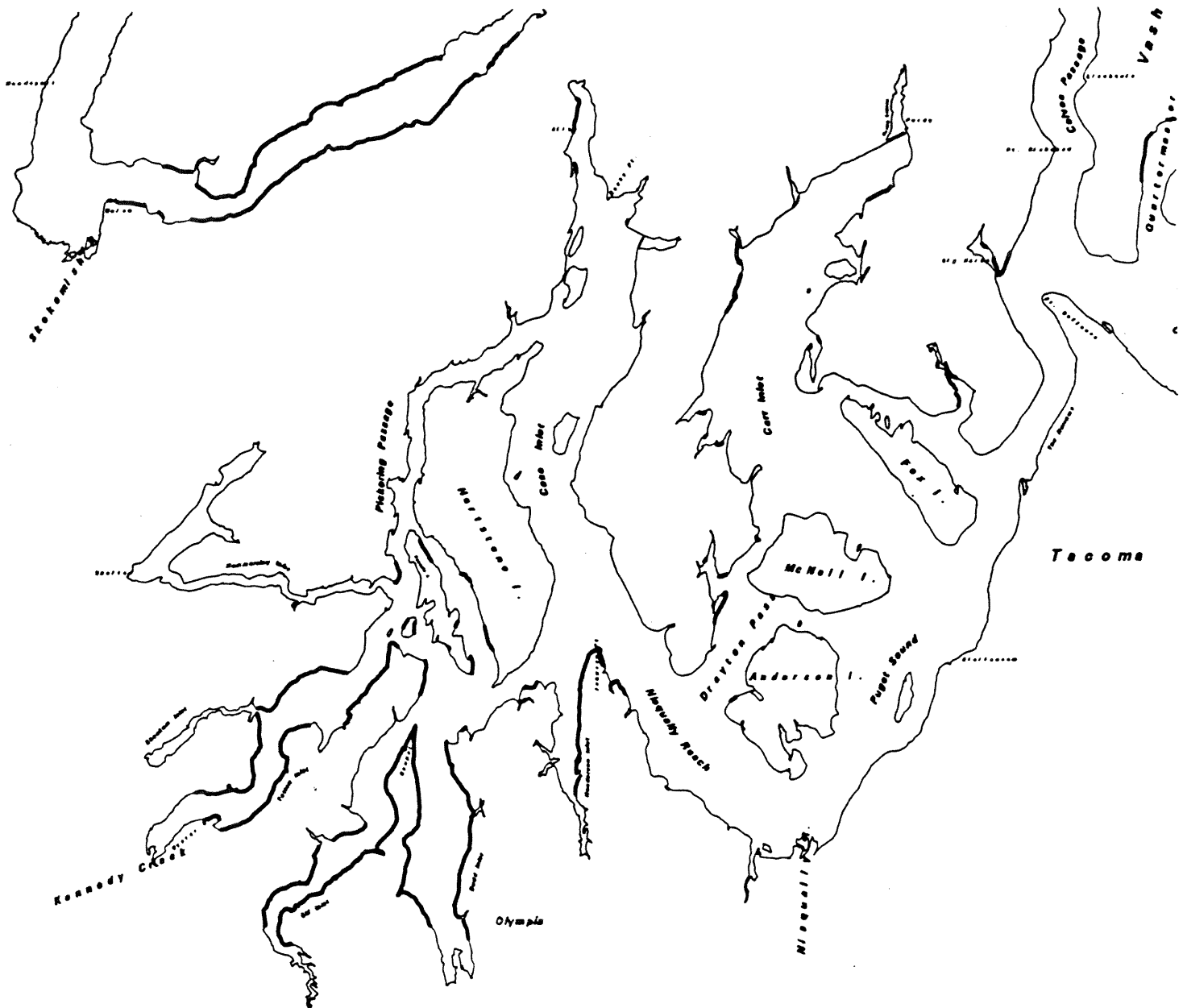
**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

# South Puget Sound Fish Resources



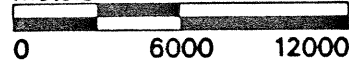
Smelt Spawning



USGS Shoreline



Meters



Source: Washington Department of Fisheries  
This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

6-23

December 7, 1994

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Pacific Sand Lance (*Ammodytes hexapterus*)

**Resource Information Mapped:** Documented intertidal spawning areas and larval rearing areas.

**Resource Use:** Human - sand lance are used as bait by recreation fishers. Non-human - important component of the marine food chain; sand lance provide the link between primary production and upper level predators. All life history stages are utilized as food by various predators including salmon, rockfish, lingcod, halibut, birds, marine mammals, etc.

**General Location or Habitat Association of Resource:** Pacific sand lance spawn from November through February and deposit their eggs on upper intertidal sandy-gravel beaches. Documented spawning areas are widely scattered throughout the region with the highest concentration in the Tacoma Narrows and Hale Pass. Sand lance larvae are widespread in the regions near-surface waters from January through March. It is suspected that additional spawning and larval habitat exists within the region. Adult sand lance are found in nearshore habitats throughout the region.

**Seasonal Sensitivity:** The highest sensitivity is during the spawning and larval stages from October through March. Eggs and larvae are highly susceptible to injury (lethal) from oil exposure.

**Recommended Protection Strategy:** Keep oil off of spawning beaches regardless of season. Utilize aggressive open water and nearshore containment and collection techniques to keep oil off of the spawning substrate. Use protection or exclusion boom where feasible.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

# South Puget Sound Fish Resources

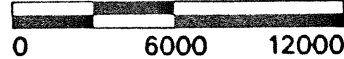


Sand Lance Spawning

Sand Lance Larvae

USGS Shoreline

Meters



Source: Washington Department of Fisheries  
 This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.  
 6-25 December 7, 1994

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Rock Sole (*lepidopsetta bilineata*)

**Resource Information Mapped:** Rock sole spawning habitat.

**Resource Use:** Human; Commercial and recreational harvest.

**General Location or Habitat Association of Resource:** Rock sole deposit their eggs in the uppermost intertidal zone on gravel generally having a grain size from 1 to 7 mm. Incubation takes 2 - 3 weeks. Spawning areas within the region include Mayo Cove, Filucy Bay, Dickenson Point, Hope Island, Hunter Point, Sandy Point, Boston Harbor, and other isolated spots. Additional undocumented spawning areas are suspected in the region.

**Seasonal Sensitivity or Occurrence:** Rock sole spawning occurs in this region from mid-December through mid-March. Eggs are highly susceptible to injury (lethal) from oil exposure.

**Recommended Protection Strategy:** Keep oil off of spawning beaches regardless of season. Utilize protective booming where possible and aggressive open water collection techniques elsewhere.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

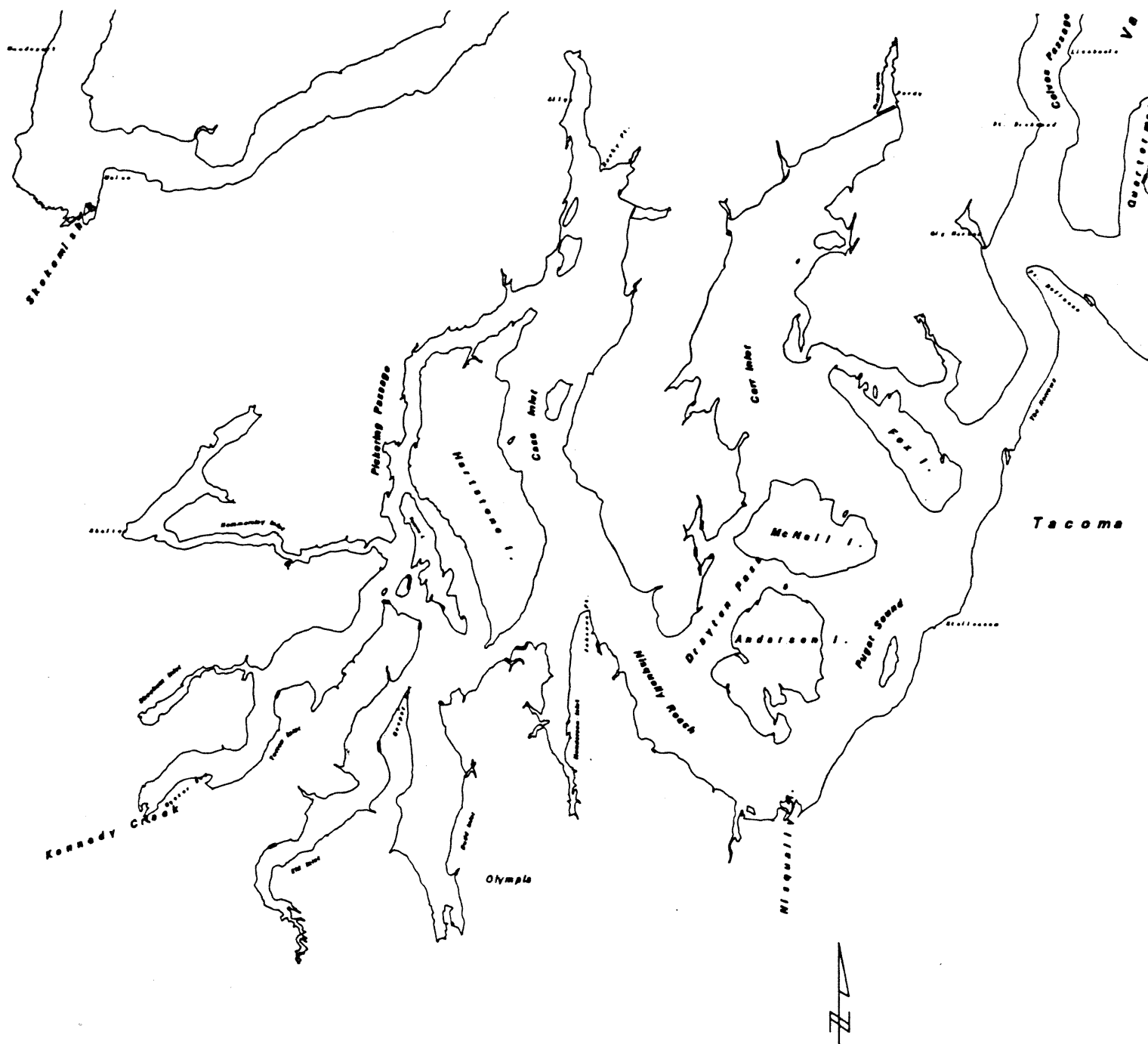
**References:**

Hart, J.L. 1973. Pacific Fishes of Canada. Fish. Res. Bd. Canada. Bull. 180. 740 pp.

WDF Baitfish Unit, unpublished data.



# South Puget Sound Fish Resources



Rocksole Spawning

USGS Shoreline

Source: Washington Department of Fisheries  
 This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Draft - November 30, 1993

## South Puget Sound Geographic Response Plan Workshop Data Recording Sheet

**Resource:** Pacific Salmon

**Resource Information Mapped:** Anadromous streams and rivers utilized by one or more of the following species for spawning and rearing: chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), sockeye (*O. nerka*), chum (*O. keta*), pink (*O. gorbuscha*), and steelhead (*O. mykiss*). A map is also provided show the location of salmon culture facilities.

**Resource Use:** Human; extensive commercial and recreational fisheries. Non-human; the list of predators on the various life history stages of salmon is extensive and includes several species of birds (bald eagle), fish, marine mammals, and terrestrial mammals.

**General Location or Habitat Association of Resource:** Salmon spawn and rear in all major Washington watersheds and in many of the smaller tributaries. Two major river systems drain into this region, the Nisqually River and the Deschutes River. Numerous salmon culture facilities are located in the region. Salmon are anadromous in that they begin life in fresh water, spend the largest portion of their life in salt water, then return to fresh water to spawn. There is a broad range of life history types both between and within the species. Both juvenile and adult salmon are present year round throughout this region.

**Seasonal Sensitivity:** Varies with species, stock, and river system. See habitat association and timing table.

**Stock Sensitivity:** White River spring chinook, which are listed by the State as critical, are resident throughout the region. The Minter Creek Hatchery and Squaxin Island net pens are used in the White River spring chinook rebuilding program.

**Recommended Protection Strategy:** In the estuaries contain and recover oil in the main channels as close to the entrances as possible or divert to shore based recovery points. Keep oil off of the intertidal flats. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum or transport it into the lower intertidal or subtidal zones. Boom the river and stream mouths where extensive tidal influence is present.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

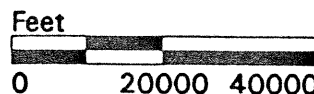
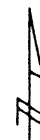
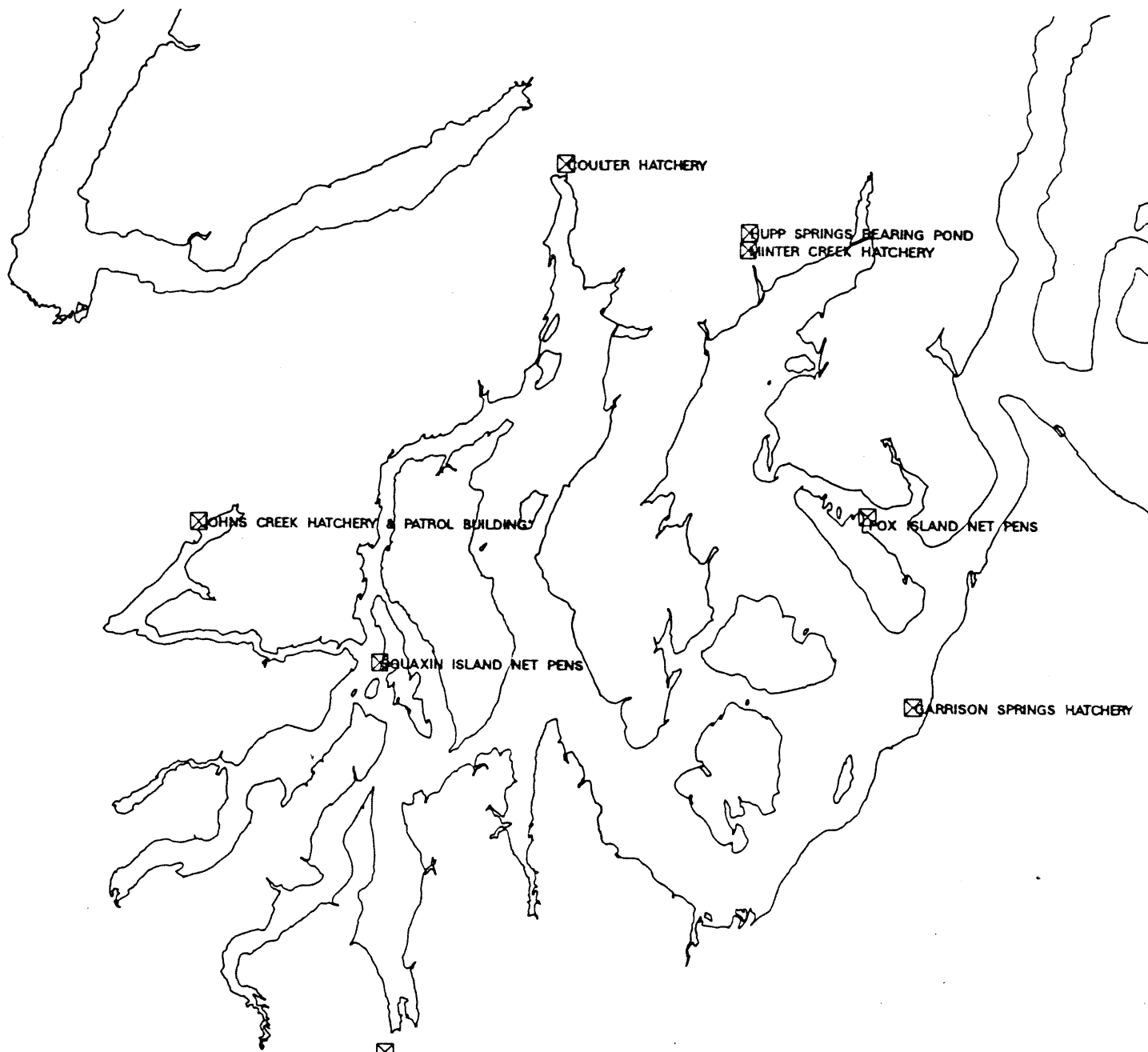
### References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

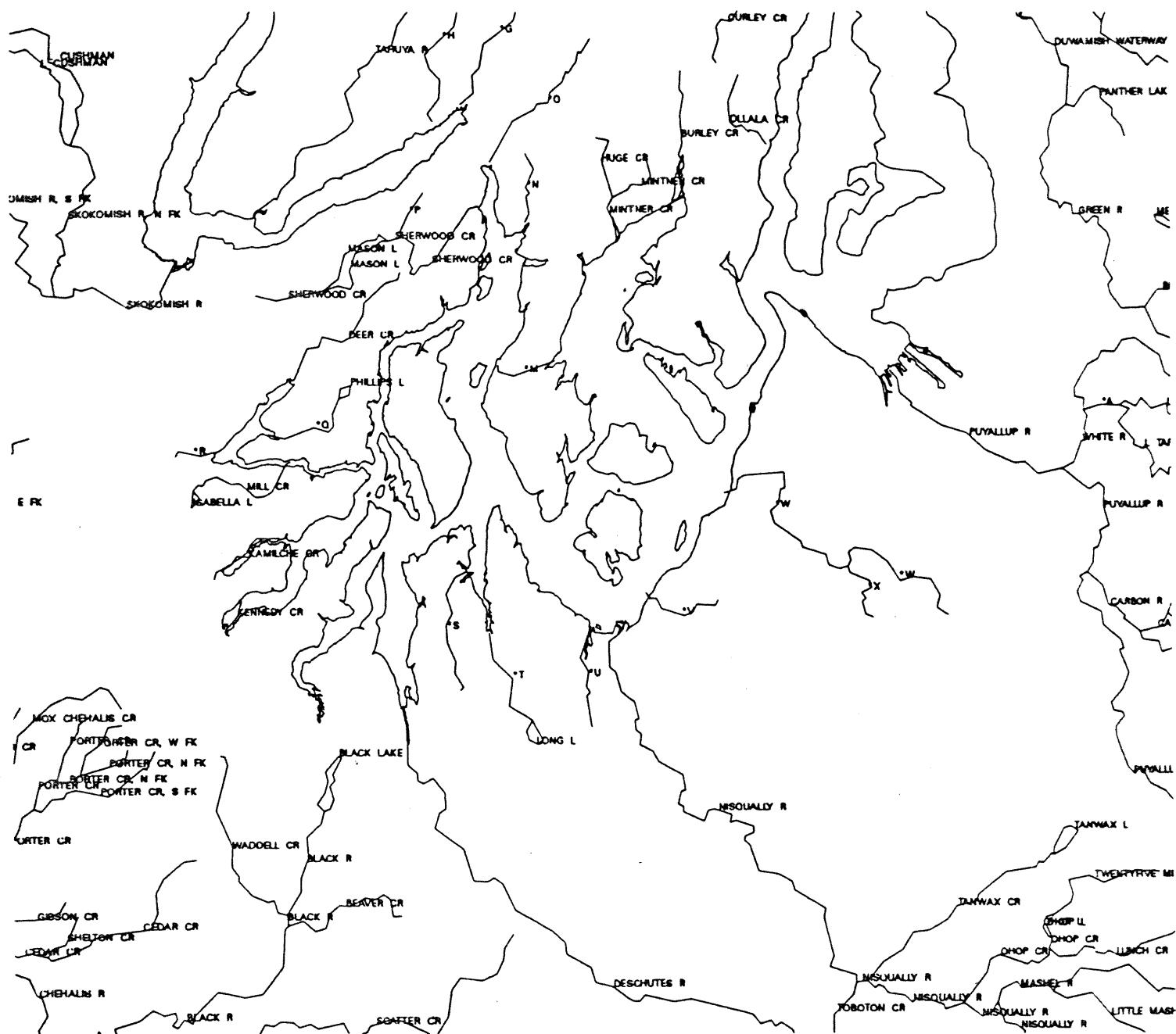
Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Indian Tribes. 1993. 1992 Washington State salmon and steelhead stock inventory (SASSI). Olympia, Washington. 212 pp.

# South Puget Sound Salmon Culture Facilities



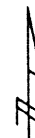


# South Puget Sound Anadromous Streams



Major Rivers

USGS Shoreline



Meters



Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Cancer Crab

**Resource Information Mapped:** Dungeness (*Cancer magister*) and red rock (*C. productus*) crab distribution. Map depicts primarily adults but does cover some juvenile areas.

**Resource Use:** Human - large commercial and recreational harvest. Non-human - all life history phases are utilized as food by numerous fish species (eg. Pacific herring, lingcod, rockfish, coho and chinook salmon, halibut, English sole and cabezon), octopus, sea otters, harbor seals, sea lions, and gulls.

**General Location or Habitat Association of Resource:** Cancer crab are found in Hale Pass and on the Nisqually River delta. Around the Nisqually River the distribution extends to Steilacoom on the east side and to Johnson Point on the west side. Adults are found from the intertidal to -90 m MLLW and prefer sandy substrates. Juveniles are found intertidally and typically associated with eelgrass, ulva, bivalve shells, or some form of cover, from +3 to -15 m MLLW. Larvae and megalopae are planktonic. Megalopae are typically found in nearshore waters where they settle to the bottom and metamorphose into juveniles during summer. Females carry incubating eggs beginning in the fall and hatching occurs between February and April.

**Seasonal Sensitivity:** Larvae/megalopae - planktonic - March through July. Juveniles - epibenthic intertidal - year-round.

**Recommended Protection Strategy:** Protect nearshore juvenile habitat, particularly eelgrass beds. Utilize protective booming where possible and aggressive open water collection techniques elsewhere.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

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# South Puget Sound Shellfish Resources

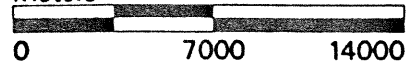
SOUTH PUGET SOUND GRP



Cancer Crab

USGS Shoreline

Meters



Source: Washington Department of Fisheries  
This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

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December 7, 1994

Draft - November 30, 1993

### South Puget Sound Geographic Response Plan Workshop Data Recording Sheet

**Resource:** Intertidal and subtidal hardshell clams and intertidal softshell clams.

**Resource Information Mapped:** Hardshell species include the native littleneck (*Protothaca staminea*), the Manila littleneck (*Tapes philippinarum*), butter clams (*Saxidomus giganteus*), piddock clams (*Zirfaea pilsbryi*), horse clams (*Tresus capax* and *T. nuttallii*), and cockles (*Clinocardium nuttali*). The only softshell species is the eastern softshell clam (*Mya arenaria*).

**Resource Use:** Human; commercial and recreational harvest. Non human; as a group clams are feed upon by a wide variety of organisms including snails, sea stars, Dungeness and rock crabs, several species of commercially and recreationally import fish, sea otters, raccoons, scoters and other birds.

**General Location or Habitat Association of Resource:** Clams are found throughout the region with higher concentrations around Hartstene and Squaxin Islands, Totten Inlet, and Oakland Bay. Clams are found from approximately +2 m MLLW in the intertidal zone to subtidal depths of -21 m MLLW.

**Seasonal Sensitivity:** Due to their sessile lifestyle in the intertidal zone clams are at high risk of exposure throughout the year. Sensitivity would be elevated during the spawning and larval period which can extend from April through October.

**Recommended Protection Strategy:** Utilize protective booming where possible and aggressive open water collection techniques elsewhere. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

#### References:

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.



# South Puget Sound Shellfish Resources



- Softshell Clams
- Subtidal Clam
- Intertidal Hardshell Clams
- USGS Shoreline

Meters  
0 6000 12000

Source: Washington Department of Fisheries  
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Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Geoduck Clams (*Panope abrupta*)

**Resource Information Mapped:** Geoduck clam distribution (commercial quantities).

**Resource Use:** Human; Geoducks support a large commercial and recreational fisheries. Non human; Geoducks are fed upon by snails, pandalid shrimp, rock crab, English sole, sand sole, rock sole, starry flounder, starfish, and sea otters.

**General Location or Habitat Association of Resource:** High concentrations of geoducks are found throughout the region. They inhabit depths from +1 to -110 m MLLW and prefer a stable mud and sand substrate.

**Seasonal Sensitivity:** Sensitivity would be highest during the spawning and larval period from April through August (peak May - July).

**Recommended Protection Strategy:** Utilize beach clean up techniques which do not transport oil into the subtidal zone.

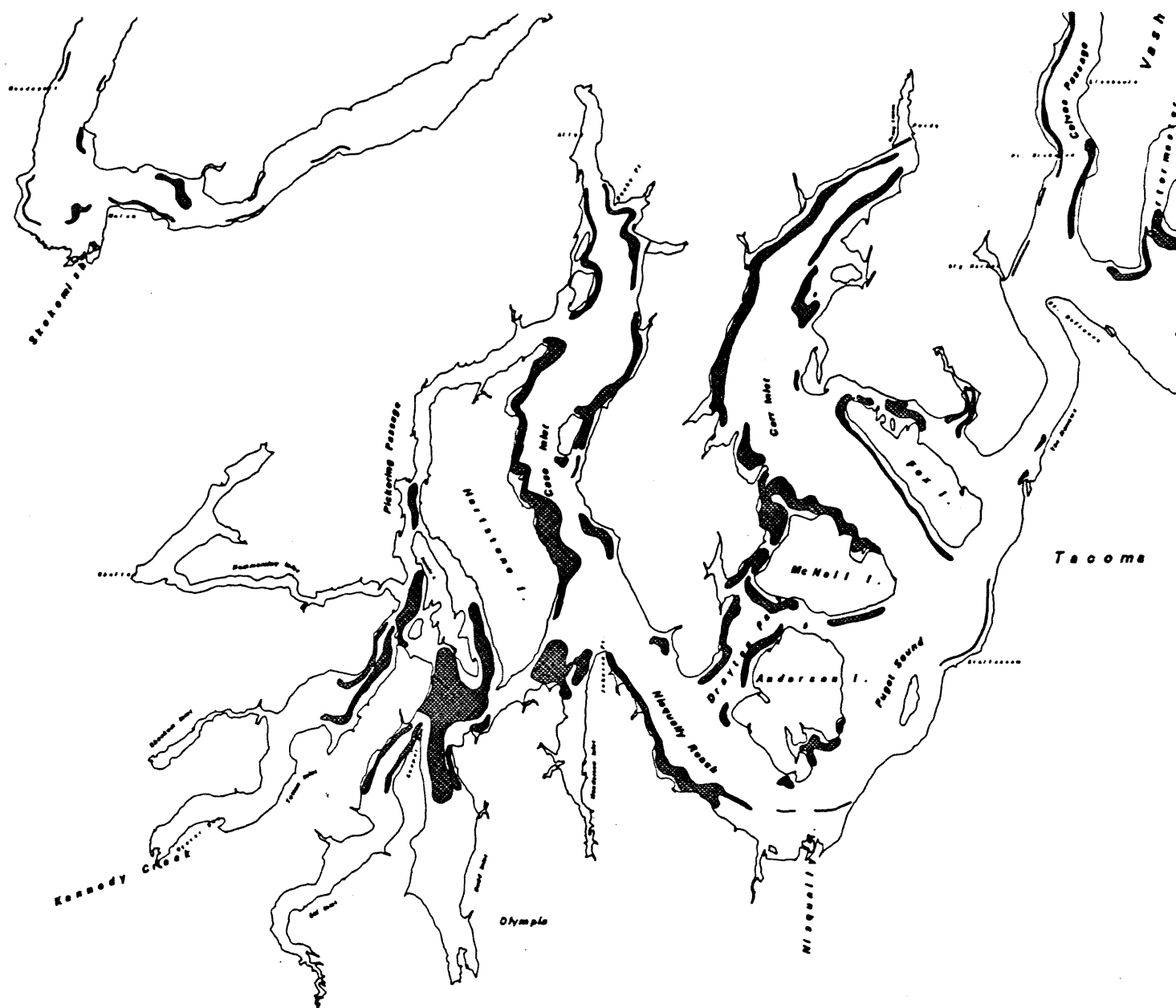
**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

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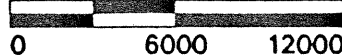
# South Puget Sound Shellfish Resources



Geoduck Clam

USGS Shoreline

Meters



Source: Washington Department of Fisheries  
This map does not offer complete information on fish and shellfish resource distribution. Comprehensive surveys have not been conducted along all shorelines.

Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Pacific Oyster (*Crassostrea gigas*)

**Resource Information Mapped:** Oyster beds, primarily cultured.

**Resource Use:** Human - recreational and commercial harvest.  
Non-human - Oyster beds provide important habitat for juvenile dungeness crab. Juvenile and adult oysters are preyed upon by dungeness and red rock crab, several starfish species, and surf and white-winged scoters.

**General Location or Habitat Association of Resource:** Pacific oysters are found in the lower intertidal and shallow subtidal zones in Henderson, Totten, Skookum, and Hammersley Inlets, and Oakland Bay.

**Seasonal Sensitivity:** Due to their sessile lifestyle in the intertidal zone oysters are at high risk of exposure throughout the year. Relative to their habitat function for juvenile dungeness crab the most sensitive period would be June through December.

**Recommended Protection Strategy:** Utilize protective booming where possible and aggressive open water collection techniques elsewhere.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.



USGS Shoreline

Age Group	Number of Respondents (approx.)
18-24	12,000
25-34	6,000
35-44	6,000
45-54	3,000
55-64	3,000
65-74	3,000
75-84	3,000
85+	3,000

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South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet

**Resource:** Blue Mussel (*Mytilus trossolus*)

**Resource Information Mapped:** Areas of mussel culture.

**Resource Use:** Human; mussels are commercially cultured and harvested as well as being recreationally harvested. Non-human; mussels are preyed upon by pile and striped perch, crabs (*Cancer* sp.), starfish, and scoters. Larvae are eaten by planktivorous fish and invertebrates.

**General Location or Habitat Association of Resource:** The blue mussel is found between +1.2 m and +3.4 m MLLW attached to rocks, gravel, shell, docks, pilings, and other man-made materials. Mussels are tolerant to a wide range of temperature and salinity. Commercial mussel culture occurs in Totten Inlet. Naturally occurring mussels are found throughout the region.

**Seasonal Sensitivity:** Due to their sessile lifestyle in the intertidal zone mussels are at high risk of exposure throughout the year. Sensitivity would be elevated during the spawning and larval period which extends from spring through mid-summer.

**Recommended Protection Strategy:** For culture operations - exclusion booming. For natural populations - utilize protective booming where possible and aggressive open water and nearshore collection techniques elsewhere. Where oil cannot be excluded from the beach use clean up techniques which do not force oil into beach substratum.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

Emmett, R.L., S.L. Stone, S.A. Hinton, and M.E. Monaco. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries; Volume II: species life history summaries. ELMR Rep. No. 8. NOAA/NOS Strategic Environmental Assessments Division, Rockville, MD, 329 p.

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# South Puget Sound Shellfish Resources

SOUTH PUGET SOUND GRP



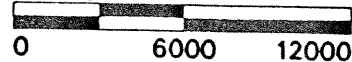
Mussel Culture



USGS Shoreline



Meters



Source: Washington Department of Fisheries  
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Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Sea Urchin

**Resource Information Mapped:** Commercial quantities of adult sea urchins, primarily the red sea urchin (*Strongylocentrotus franciscanus*).

**Resource Use:** Human - commercial fishery. Non-human - dominant organism in rocky nearshore communities, responsible for shaping the character of the habitat through their grazing activities. Important prey item for wolf eels and sea otters.

**General Location or Habitat Association of Resource:** Sea urchins are found in the Tacoma Narrows. Urchins are found from the lower intertidal to depths of 125 m but the highest densities are found at depths less than 30 m. Juveniles are found in adult habitat and require the adults presence to survive.

**Seasonal Sensitivity:** Spawning occurs during the spring followed by a planktonic larval phase that lasts from 60 to 130 days. Adults are susceptible to oil exposure via ingestion of contaminated marine algae, particularly kelp. Highest risk of this type of exposure is from April to November.

**Recommended Protection Strategy:** Prevent oil from contaminating nearshore kelp beds. Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

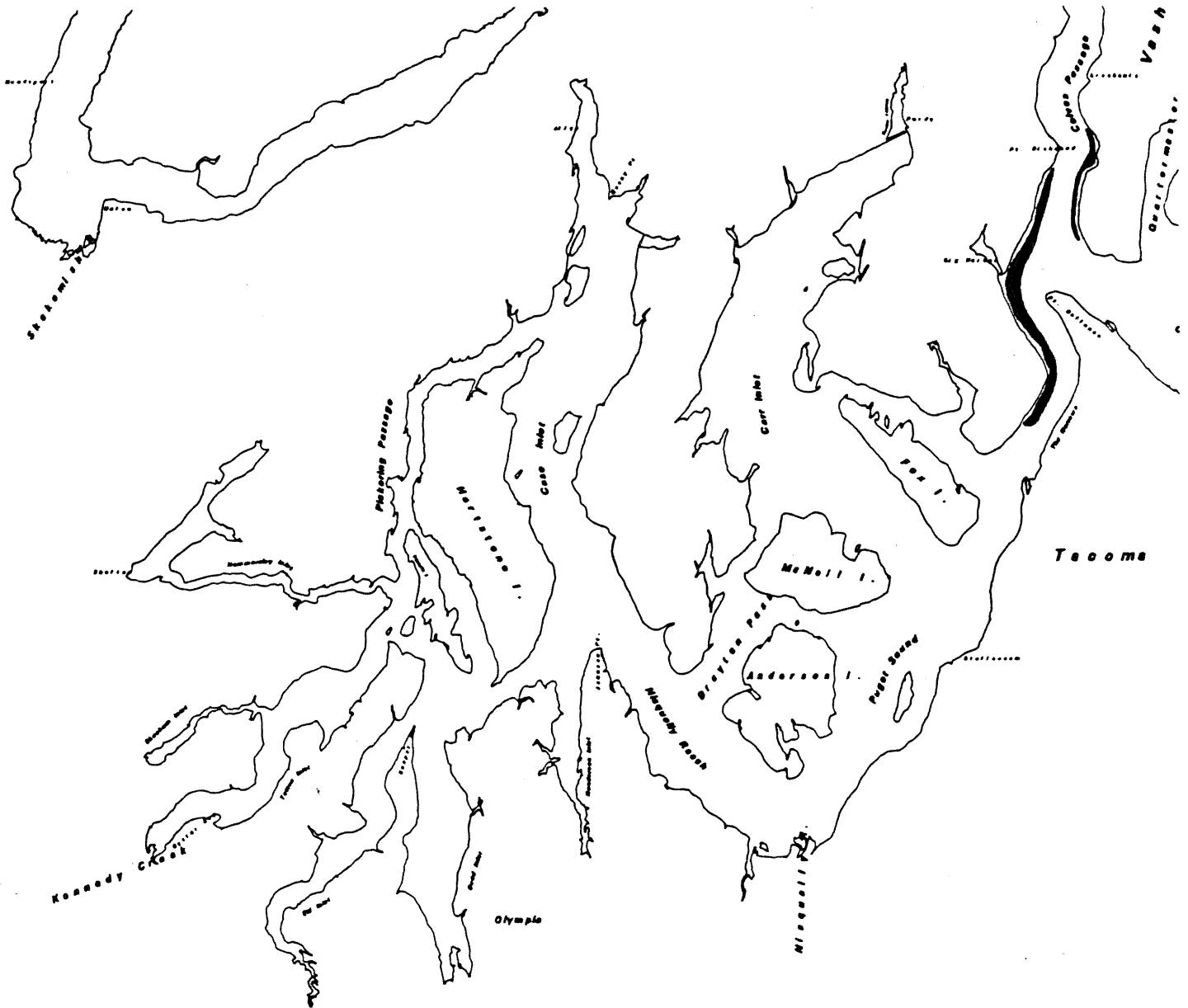
**References:**

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# South Puget Sound Shellfish Resources

SOUTH PUGET SOUND GRP



Urchin

USGS Shoreline

Meters

0 7000 14000

Source: Washington Department of Fisheries  
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Draft - November 30, 1993

**South Puget Sound Geographic Response Plan Workshop  
Data Recording Sheet**

**Resource:** Pandalid Shrimp

**Resource Information Mapped:** Harvest areas for four species of shrimp including; pink (*Pandalus jordani* and *P. borealis*), coonstripe (*P. danae*), and spot prawn (*P. platyceros*).

**Resource Use:** Human - commercial and recreational fisheries. Non-human - food organism for many fish species including rockfish, cabezon, and perch.

**General Location or Habitat Association of Resource:** Most harvest occurs in waters 100 to 220 m deep, however, the coonstripe and spot prawn are found as shallow as the lower intertidal zone. The primary harvest areas in this region Nisqually Reach and Carr Inlet.

**Seasonal Sensitivity:** Planktonic larval phase from February through July.

**Recommended Protection Strategy:** Utilize beach clean up techniques that do not transport oil into shallow subtidal area.

**Information Recorder:** WDF - Oil Spill Response and Damage Prevention Unit

**References:**

Washington Department of Fisheries. 1992. Salmon, marine fish and shellfish resources and associated fisheries in Washington's coastal and inland marine waters. Wa. Dept. Fish. Tech. Rpt. 79. 70 p.

Hueckel, G.J. 1980. Foraging on an artificial reef by three Puget Sound fish species. Wa. Dept. Fish. Tech. Rpt. 53. 110 p.



USGS Shoreline

6-45

December 7, 1994

# Puget Sound Fish and Shellfish Habitat Association Table - Key

Life Stages -  
eggs  
larvae  
juveniles  
spawners/spawning  
parturition (birth)  
adults

Timing -  
--- common  
+++ abundant  
\*\*\* highly abundant

6-46 Salinity Range -  
tidal fresh 0.0 - 0.5 ppt  
mixing 0.5 - 25.0 ppt  
seawater >25.0 ppt

Habitats -  
intertidal 0-3 m  
subtidal 3-10m

Data Source -  
Monaco, M.E. et al. 1990. Distribution and abundance of fishes and invertebrates in west coast estuaries. Vol. I: Data summaries. ELMR Rept. 4. Strategic Assessment Branch, NOS/NOAA, Rockville, MD  
Emmett, R.L. et al. 1991. Distribution and abundance of fishes and invertebrates in west coast estuaries. Vol. II: Species Life History Summaries. ELMR Rept. 8. Strategic Assessment Branch, NOS/NOAA, Rockville, MD

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SOUTH PUGET SOUND GRP

DRAFT

# Fish Habitat Association in Puget Sound

Species	Timing	Salinity Range			Substrate Preference									Habitats							
														Type			Area				
		Tidal	Fresh		Mud / Silt / Clay	Sand / Granule	Pebble	Cobble	Boulder / Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat	
Spring Chinook Salmon	J F M A M J J A S O N D																				
	Juveniles	-----+++++	X	X	X		X	X	X								X	X	X	X	X
	adults	--+++++	X	X	X		X	X	X								X	X	X	X	X
Fall Chinook Salmon	J F M A M J J A S O N D																				
	Juveniles	-----+++++	X	X	X		X	X	X								X	X	X	X	X
	adults	-----+++++	X	X	X		X	X	X								X	X	X	X	X
Sockeye Salmon	J F M A M J J A S O N D																				
	Juveniles	----+-----	X	X	X									X			X	X	X	X	X
	adults	--+++++	X	X	X		X	X									X	X	X	X	X
Coho Salmon	J F M A M J J A S O N D																				
	Juveniles	----+-----	X	X	X		X	X									X	X	X	X	X
	adults	----+-----	X	X	X		X	X									X	X	X	X	X
Chum Salmon	J F M A M J J A S O N D																				
	Juveniles	--+++++	X	X	X								X				X	X	X	X	X
	adults	++-----	X	X	X		X	X									X	X	X	X	X

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SOUTH PUGET SOUND GRP

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# Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference									Habitats						
														Type			Area			
		Tidal	Fresh	Sea water	Mud / Silt / Clay	Sand / Granule	Pebble	Cobble	Boulder / Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Main stem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
Pink Salmon		J F M A M J J A S O N D																		
	Juveniles	++++*****+-----	X	X	X								X			X	X	X	X	X
	adults	--+***+--	X	X	X		X	X								X	X	X	X	X
Surf Smelt		J F M A M J J A S O N D																		
	eggs	*****		X	X		X							X						
	larvae	+++++++ ++++++		X	X		X							X						
	Juveniles	+++++++ ++++++		X	X							X				X	X	X	X	X
	spawners	*****		X	X		X							X						
	adults	+++++++ ++++++		X	X							X				X	X	X	X	X
Herring		J F M A M J J A S O N D																		
	eggs	*****		X	X						X	X		X	X					X
	larvae	*****+---		X	X							X				X	X	X	X	X
	Juveniles	+++++++ ++++++		X	X							X				X	X	X	X	X
	spawners	*****		X	X						X	X		X	X					X
	adults	*****		X	X							X				X	X	X	X	

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SOUTH PUGET SOUND GRP

DRAFT

# Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference										Habitats							
															Type			Area				
		Tidal	Fresh		Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Rilprop	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
Longfin Smelt	J F M A M J J A S O N D						X												X			
	eggs						X												X			
	larvae	-----	---	X	X	X		X										X	X	X	X	
	juveniles	-----			X	X								X				X	X	X	X	
	adults	-----	---	X	X	X								X				X	X	X	X	
Anchovy	J F M A M J J A S O N D														X				X			
	eggs	--			X	X									X				X			
	larvae	----			X	X									X				X	X	X	X
	juveniles	-----			X	X									X				X	X	X	X
	spawners	----			X	X									X				X			
	adults	-----			X	X									X				X	X	X	X
Sand Lance	J F M A M J J A S O N D															X	X	X	X			
	eggs	+++++++	+++		X	X		X								X	X	X	X			
	larvae	+++++++			X	X		X										X	X			
	juveniles	+++++++	+++++		X	X		X								X	X	X	X			
	spawners	+++++	+++		X	X		X								X	X	X	X			
	adults	-----			X	X		X								X	X	X	X			

# Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference									Habitats								
														Type			Area					
		Tidal	Fresh		Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
Shiner Perch	J F M A M J J A S O N D																					
	juveniles	+++++*****	X	X	X	X	X						X		X		X	X	X	X	X	X
	parturition	---++++--			X		X	X					X		X				X	X	X	X
	adults	*****			X	X	X	X					X		X		X	X	X	X	X	X
Perch	J F M A M J J A S O N D																					
	juveniles	+++*****+	X	X	X	X	X						X					X	X	X	X	X
	parturition	---++++--			X	X	X	X					X						X	X	X	X
	adults	---++++*****			X	X	X	X					X					X	X	X	X	X
Pacific Tomcod	J F M A M J J A S O N D																					
	larvae	-----			X	X									X				X	X	X	
	juveniles	-----+++++			X	X	X	X					X	X			X		X	X	X	
	adults	+++++			X	X	X	X									X		X	X	X	

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SOUTH PUGET SOUND GRP

DRAFT



# Fish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference									Habitats							
														Type			Area				
		Tidal	Fresh	Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
English Sole	J F M A M J J A S O N D																				
	eggs	*****			X								X								
	larvae	+++++++		X	X	X							X			X	X	X			
	juveniles	*****		X	X	X	X					X	X		X	X		X	X	X	X
	spawning	+++++++		X	X	X	X								X						
	adults	+++++++		X	X	X	X					X	X			X		X			
Starry Flounder	J F M A M J J A S O N D																				
	eggs	-----			X								X			X					
	larvae	-----		X	X								X			X	X				
	juveniles	-----	X	X	X	X	X					X	X		X	X		X	X	X	X
	spawning	-----			X		X														
	adults	+++++++		X	X	X	X					X	X		X	X		X	X		
Ling Cod	J F M A M J J A S O N D																				
	eggs	-----			X					X	X				X	X					
	larvae	-----		X	X								X			X					
	juveniles	-----		X	X	X	X			X	X	X	X		X	X		X	X	X	
	spawning	-----			X					X	X				X	X					
	adults	-----			X					X	X		X		X	X					

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LEWIS

SOUTH PUGET SOUND GRP

# Shellfish Habitat Association in Puget Sound

Species	Timing	Salinity Range			Substrate Preference									Habitats							
														Type			Area				
		Tidal Fresh	Mixing	Seawater	Mud / Silt / Clay	Sand / Gravel	Pebble	Cobble	Boulder / Riprap	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat	
Dungeness Crab	J F M A M J J A S O N D																				
eggs	-----																				
larvae	-----		X	X									X			X	X	X			
Juveniles	-----+*****+---		X	X	X	X	X				X			X	X		X	X	X	X	
mating	-----													X	X						
adults	+++++		X	X	X	X	X							X	X		X	X	X		
Blue Mussel	J F M A M J J A S O N D																				
eggs	++++*****+		X	X									X			X	X	X	X	X	
larvae	++++*****+		X	X									X			X	X	X	X	X	
Juveniles	*****		X	X				X	X	X				X	X		X	X	X	X	
spawning	++++*****+		X	X									X	X	X		X	X	X	X	
adults	*****		X	X				X	X	X				X	X		X	X	X	X	
Softshell Clam	J F M A M J J A S O N D																				
eggs	+++++++		X	X									X			X	X	X	X	X	
larvae	+++++++		X	X									X			X	X	X	X	X	
Juvenile	+++++		X	X	X	X								X	X		X	X	X	X	
spawning	+++++++		X	X									X	X	X		X	X	X	X	
adults	+++++		X	X	X	X								X	X		X	X	X	X	

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LEAF

SOUTH PUGET SOUND GRP

# Shellfish Habitat Association in Puget Sound (cont.)

Species	Timing	Salinity Range			Substrate Preference										Habitats						
		Tidal	Fresh	Mixing	Seawater	Mud/Silt/Clay	Sand/Granule	Pebble	Cobble	Boulder/Ripp	Rocky Outcrop	Estuarine Veg	Marine Veg	None	Type			Area			
															Benthic Intertidal	Benthic Subtidal	Pelagic	Mainstem Channel	Subsidiary Channel	Channel Edge	Intertidal Flat
Pacific Gaper Clam	J F M A M J J A S O N D																				
eggs	+++++			X	X									X			X	X	X	X	X
larvae	+++++			X	X									X			X	X	X	X	X
juvenile	+++++			X	X	X	X								X	X		X	X	X	X
spawning	+++++			X	X										X	X		X	X	X	X
adults	+++++			X	X	X	X								X	X		X	X	X	X
Horse Clam	J F M A M J J A S O N D																				
eggs	-----													X			X	X	X	X	X
larvae	-----			X	X									X			X	X	X	X	X
juvenile	+++++			X	X	X	X								X	X		X	X	X	X
spawning	-----														X	X		X	X	X	X
adults	+++++			X	X	X	X								X	X		X	X	X	X
Little Neck Clam	J F M A M J J A S O N D																				
eggs	*****												X				X	X	X	X	X
larvae	*****												X				X	X	X	X	X
juveniles	*****			X	X	X	X	X	X						X	X		X	X	X	X
spawning	*****													X	X	X		X	X	X	X
adults	*****			X	X	X	X	X	X						X	X		X	X	X	X

FLORIDA

SOUTH PUGET SOUND GRP